

What is claimed is:

1. An image processing system comprising:

image projection means for projecting at least two different colored calibration
5 images at different points of time;

sensing means for sensing each of the projected calibration images to output
sensed information;

ratio information generating means for computing a ratio of image signal
values or luminance values for each pixel in a sensing area obtained by sensing the
10 calibration images, based on the sensed information to generate ratio information;

edge point detecting means for searching the ratio information to find a first
value which represents a ratio of image signal values or luminance values among pixel
regions each having a predetermined number of pixels in the sensing area, and for
detecting edge points of a sensed projected image, based on part of the pixel regions
15 each having the first value equal to or larger than a first predetermined value;

pixel block image information generating means for converting sensed
information of an area defined by the detected edge points into pixel block image
information representing a ratio of image signal values or luminance values for each
pixel block including one or more pixels, based on the sensed information and the
20 detected edge points; and

correction means for correcting an image signal based on the pixel block image
information,

wherein the image projection means projects an image based on the corrected
image signal.

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2. The image processing system as defined in claim 1, wherein:

the ratio information generating means includes means for detecting a

rectangular region defined by the pixel regions each having the first value equal to or larger than the first predetermined value as a temporary sensed projected image by searching the ratio information for the first value in vertical and horizontal directions from corner points of an area corresponding to the sensing area represented by the ratio information;

an image projected by the image projection means is a quadrangle; and

the edge point detecting means detects corner points at four corners of the sensed projected image as the edge points of the sensed projected image, based on the temporary sensed projected image.

3. The image processing system as defined in claim 2, wherein:

when the number of detected corner points is three or less in detecting corner points at four corners of the sensed projected image, the edge point detecting means detects other corner points by using a predetermined method; and

the predetermined method includes:

counting the numbers of pixels from an edge pixel to a pixel having the ratio represented by the ratio information equal to or larger than a second predetermined value in each pixel line of the temporary sensed projected image;

computing a changing rate of a ratio of the number of pixels in every two adjacent pixel lines of the temporary sensed projected image; and

detecting pixels having the ratio represented by the ratio information equal to or larger than the second predetermined value as the other corner points in a pixel line having the changing rate equal to or larger than a third predetermined value.

4. The image processing system as defined in claim 1,

wherein the correction means includes:

distortion correction means for correcting an image signal to correct a

distortion in an image based on the pixel block image information when a predetermined calibration image is projected; and

color non-uniformity correction means for correcting an image signal to correct color non-uniformity based on the pixel block image information when a predetermined calibration image is projected; and

wherein the image projection means projects an image based on the corrected image signal.

5. A projector comprising:

image projection means for projecting at least two different colored calibration images at different points of time;

sensing means for sensing each of the projected calibration images to output sensed information;

ratio information generating means for computing a ratio of image signal values or luminance values for each pixel in a sensing area obtained by sensing the calibration images, based on the sensed information to generate ratio information;

edge point detecting means for searching the ratio information to find a first value which represents a ratio of image signal values or luminance values for pixel regions each having a predetermined number of pixels in the sensing area, and for detecting edge points of a sensed projected image, based on part of the pixel regions each having the first value equal to or larger than a first predetermined value;

pixel block image information generating means for converting sensed information of an area defined by the detected edge points into pixel block image information representing a ratio of image signal values or luminance values for each pixel block including one or more pixels, based on the sensed information and the detected edge points; and

correction means for correcting an image signal based on the pixel block image

information,

wherein the image projection means projects an image based on the corrected image signal.

5 6. An image processing system comprising:

image projection section which projects at least two different colored calibration images at different points of time;

sensing section which senses each of the projected calibration images to output sensed information;

10 ratio information generating section which computes a ratio of image signal values or luminance values for each pixel in a sensing area obtained by sensing the calibration images, based on the sensed information to generate ratio information;

edge point detecting section which searches the ratio information to find a first value which represents a ratio of image signal values or luminance values for pixel
15 regions each having a predetermined number of pixels in the sensing area, and detects edge points of a sensed projected image, based on part of the pixel regions each having the first value equal to or larger than a first predetermined value;

pixel block image information generating section which converts sensed information of an area defined by the detected edge points into pixel block image
20 information representing a ratio of image signal values or luminance values for each pixel block including one or more pixels, based on the sensed information and the detected edge points; and

correction section which corrects an image signal based on the pixel block image information,

25 wherein the image projection section projects an image based on the corrected image signal.

7. A projector comprising:

image projection section which projects at least two different colored calibration images at different points of time;

5 sensing section which senses each of the projected calibration images to output sensed information;

ratio information generating section which computes a ratio of image signal values or luminance values for each pixel in a sensing area obtained by sensing the calibration images, based on the sensed information to generate ratio information;

10 edge point detecting section which searches the ratio information to find a first value which represents a ratio of image signal values or luminance values for pixel regions each having a predetermined number of pixels in the sensing area, and detects edge points of a sensed projected image, based on part of the pixel regions each having the first value equal to or larger than a first predetermined value;

15 pixel block image information generating section which converts sensed information of an area defined by the detected edge points into pixel block image information representing a ratio of image signal values or luminance values for each pixel block including one or more pixels, based on the sensed information and the detected edge points; and

20 correction section which corrects an image signal based on the pixel block image information,

wherein the image projection section projects an image based on the corrected image signal.

8. A computer-readable program causing a computer to function as:

25 image projection means for projecting at least two different colored calibration images at different points of time;

sensing means for sensing each of the projected calibration images to output

sensed information;

ratio information generating means for computing a ratio of image signal values or luminance values for each pixel in a sensing area obtained by sensing the calibration images, based on the sensed information to generate ratio information;

5 edge point detecting means for searching the ratio information to find a first value which represents a ratio of image signal values or luminance values for pixel regions each having a predetermined number of pixels in the sensing area, and for detecting edge points of a sensed projected image, based on part of the pixel regions each having the first value equal to or larger than a first predetermined value;

10 pixel block image information generating means for converting sensed information of an area defined by the detected edge points into pixel block image information representing a ratio of image signal values or luminance values for each pixel block including one or more pixels, based on the sensed information and the detected edge points; and

15 correction means for correcting an image signal based on the pixel block image information,

 wherein the image projection means projects an image based on the corrected image signal.

20 9. An information storage medium storing a computer-readable program which causes a computer to function as:

 image projection means for projecting at least two different colored calibration images at different points of time;

25 sensing means for sensing each of the projected calibration images to output sensed information;

 ratio information generating means for computing a ratio of image signal values or luminance values for each pixel in a sensing area obtained by sensing the

calibration images, based on the sensed information to generate ratio information;

edge point detecting means for searching the ratio information to find a first value which represents a ratio of image signal values or luminance values for pixel regions each having a predetermined number of pixels in the sensing area, and for
5 detecting edge points of a sensed projected image, based on part of the pixel regions each having the first value equal to or larger than a first predetermined value;

pixel block image information generating means for converting sensed information of an area defined by the detected edge points into pixel block image information representing a ratio of image signal values or luminance values for each
10 pixel block including one or more pixels, based on the sensed information and the detected edge points; and

correction means for correcting an image signal based on the pixel block image information,

wherein the image projection means projects an image based on the corrected
15 image signal.

10. An image processing method comprising:

sequentially projecting a plurality of monochromatic calibration images of different colors;

20 sensing the projected calibration images and outputting sensed information;

computing a ratio of image signal values or luminance values for each pixel in a sensing area obtained by sensing the projected calibration images, based on the sensed information;

generating ratio information for the sensing area;

25 searching the ratio information to find a first value which represents a ratio of image signal values or luminance values for pixel regions each having a predetermined number of pixels in the sensing area, and detecting edge points of a sensed projected

image, based on part of the pixel regions having the first value equal to or larger than a first predetermined value;

converting sensed information of an area defined by the detected edge points into pixel block image information representing a ratio of image signal values or luminance values for each pixel block including one or more pixels, based on the sensed information and the detected edge points;

correcting an image signal to correct at least one of distortion, color and brightness in the image, based on the pixel block image information; and

projecting an image based on the corrected image signal.

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11. The image processing method as defined in claim 10, further comprising:

detecting a rectangular region defined by the pixel regions each having the first value equal to or larger than the first predetermined value as a temporary sensed projected image by searching the ratio information for the first value in vertical and horizontal directions from corner points of an area corresponding to the sensing area represented by the ratio information; and

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detecting corner points at four corners of the sensed projected image as the edge points of the sensed projected image, based on the temporary sensed projected image.

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12. The image processing method as defined in claim 11, wherein:

when the number of detected corner points is three or less in detecting corner points at four corners of the sensed projected image, other corner points are detected by a predetermined method; and

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the predetermined method includes:

counting the numbers of pixels from an edge pixel to a pixel having the ratio represented by the ratio information equal to or larger than a second predetermined

value in each pixel line of the temporary sensed projected image;

computing a changing rate of a ratio of the number of pixels in every two adjacent pixel lines of the temporary sensed projected image; and

5 detecting pixels having the ratio represented by the ratio information equal to or larger than the second predetermined value as the other corner points in a pixel line having the changing rate equal to or larger than a third predetermined value.